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A STATUS REPORT ON THE U.S. NATIONAL DIOXIN STUDY

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ABSTRACT

In 1983, the US Environmental Protection Agency (EPA) embarked on an extensive investigation of the presence and extent of contamination of the national environment by CDDs/CDFs. This status report is a prelude to a final report to be delivered to the US Congress in December, 1985.

I. Background

In the early 1980s, the issue of 2,3,7,8-TCDD in the environment of the United States drew considerable public attention. For example, this and/or other chlorinated dibenzo-p-dioxins and dibenzofurances (CDDs/CDFs) were associated with Agent Orange (a defoliant used in Vietnam), 2,4,5-T (a civilian use herbicide), inappropriate disposal of industrial wastes (Love Canal and Times Beach), and emissions from a variety of combustion sources.

In 1983, the Environmental Protection Agency (EPA) responded to the concerns by issuing a Dioxin Strategy (USEPA, 1983a), which described the Agency's full range of activities planned and/or underway to address the question. A major feature of the Strategy, the National Dioxin Study, consists of seven tiers of activities aimed at assessing the extent of contamination of the US environment by "dioxins", principally 2,3,7,8-TCDD. The Study is nearing completion and will culminate in a report to the US Congress in December, 1985.

II. Description

The investigation into the presence of 2,3,7,8-TCDD in the US environment is divided into the seven separate tiers noted in Table 1.

In Tier 1, sites of previous production of 2,4,5-trichlorophenol (2,4,5-TCP) are being examined for the presence of 2,3,7,8-TCDD, the principal CDD/CDF contaminant expected in the chemical synthesis. The sites at which the wastes associated with this production are being investigated in Tier 1A.

2,4,5-TCP is the parent compound from which several important pesticidal derivatives were synthesized in the US, including 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), silvex, and hexachlorophene. Tier 2 marks the investigation of sites of production of 2,4,5-TCP derivatives. The Tier 2A investigation is a study of those sites at which the associated production wastes were disposed.

Table 1 -- COMPONENTS OF THE NATIONAL DIOXIN STUDY

Tier 1	2,4,5-TCP Production Sites
Tier 1 A	Associated waste disposal sites
Tier 2	2,4,5-TCP Derivative Production Sites
Tier 2A	Associated waste disposal sites
Tier 3	2,4,5-TCP and Derivative Formulation Sites
Tier 4	Combustion Sites
Tier 5	Previous and Current Use Sites
Tier 6	Suspect Production Sites
Tier 7	Background Levels

Experience has shown that environmental contamination can occur during operations associated with the formulation of technical 2,4,5-TCP and its derivatives into commercial products. Hence, these formulation locations are being sampled and analyzed for the presence of 2,3,7,8-TCDD in Tier 3 activities.

Tier 4 marks the EPA's investigation into the presence of the full range of CDDs/CDFs associated with a variety of combustion sources. A conscious decision was made not to include municipal waste combustors in this study. Previous studies by EPA (USEPA, 1981; USEPA,1983b) and investigators throughout the world had established by the early 1980s that CDDs/CDFs are generally emitted during the combustion of municipal waste. The intent of Tier 4 activities is to increase the types of sources which are contained in the CDD/CDF emissions data base. Therefore, a variety of sources were selected for investigation, based upon their likelihood of actually emitting CDDs/CDFs. Table 2 identifies the types of sources included in Tier 4 and the kinds of samples being collected and analyzed.

In Tier 5, the Agency is collecting and subjecting to 2,3,7,8-TCDD analysis samples from some of the sites where 2,4,5-T and silvex have been used; e.g., forest spray and rice growing areas.

There are a number of synthetic chemicals for which there is reason to believe that 2,3,7,8-TCDD might be formed if process conditions were favorable to its formation (Esposito, et al, 1980). In Tier 6, the Agency is investigating manufacturing sites of some of these less likely sources of 2,3,7,8-TCDD.

Finally, Tier 7 marks an attempt to determine the presence and extent of 2,3,7,8-TCDD contamination in samples from the general background. This portion of the study involves collecting hundreds of samples of soil (from rural and urban sites) and fish.

III. Status

Table 3 summarizes the status of the National Dioxin Study as of the date of the 5th International Symposium on Chlorinated Dioxins and Related Compounds.

Table 2 -- TIER 4 INVESTIGATIONS OF COMBUSTION SOURCES

Stack and Ash Samples	Ash Samples Only
Municipal sludge incinerators (3)	Charcoal manufacturing
Black liquor boilers (3)	Utility boiler
Industrial incinerator	Coal spreader stoker
Wire reclamation facility	Industrial boiler
Industrial carbon regenerator	Open burning
Drum and barrel reclamation facility	Sulfite liquor boiler
Wood stove	Apartment house incinerator
Pentachlorophenol treated wood boiler	Hazardous waste incinerator
Secondary metals blast furnace	Residential combustion of contaminated oil
	Rotary kiln hazardous waste incinerator
	Hospital incinerator

IV. Conclusion

EPA is completing a multi-million dollar investigation into the presence of, primiarily, 2,3,7,8-TCDD in the US environment. Althought only a portion of the results are available at this time and, therefore, definitive conclusions are not possible, the data in hand indicate that in most instances significnt levels of 2,3,7,8-TCDD have only been found where the Agency expected to find them; i.e., at some -- but not all -- of the sites of manufacturing and processing of certain chemicals. Where appropriate, localities have been notified and contaminated sites referred to our Superfund office for consideration. The limited fish data suggest that while 2,3,7,8-TCDD (in the low ppt levels) is somewhat more prevalent in fish than in background soils, its occurence in the environment is generally not widespread. Further study is being conducted in those areas where low level contamination was found but not suspected.

In no instance has contamination been found at such a level as to indicate the necessity for immediate emergency action.

REFERENCES

Esposito, M.P., T.O. Tiernan and Forest E. Dryden, 1980. Dioxins, USEPA, November.

USEPA, 1981. Interim evaluation of health risks associated with emissions of tetrachlorinated dioxins from municipal waste resource recovery facilities, Office of the Deputy Administrator. November 19.

USEPA, 1983a. Dioxin Strategy, Office of Water Regulations and Standards and the Office of Solid Waste and Emergency Response, November 28.

USEPA, 1983b. TCDD Emissions for Municipal Waste Combustors. Memo from Michael Cook, Deceber 16.

TABLE 3 -- STATUS OF THE NATIONAL DIOXIN STUDY (as of 9/85)

Tiers 1 and 2	
No. of sites	20
No. sampled	18
No. completely analyzed	18
% of completed > 1 ppb*	72%

Tiers 1A and 2A	
No. of sites	85
No. sampled	77
No. completely analyzed	77
% of completed > 1 ppb*	87%

Tier 3	
No. of sites	70
No. sampled	70
No. completely analyzed	43
% of completed > DL* (1)	17%

(1)

Detection limits	Highest value
Soil: 1 ppb	364 ppb
Fish: 1 ppt	5 ppt
Sediment: 1 ppt	21 ppt
Water: low ppt	Non-detected

Tier 4	
No. of stack & ash sites	13
No. of ash only samples	1
% of samples collected	100%
% of samples analyzed(2)	0%

Tier 5	
No. of sites	26
No. sampled	25
No. completely analyzed	7
% of completed > DL* (3)	14%

Tier 6	
No. of sites	20
No. sampled	20
No. completely analyzed	9
% of completed > DL* (4)	33%

(2) Samples in Tier 4 will be analyzed for all CDDs/CDFs

(3)

Detection limits	Highest value
Soil: 1 ppt	564 ppt
Fish: 1 ppt	Non-detected
Sediment: 1 ppt	Non-detected

(4)

Detection limits	Highest value
Soil: 1 ppb	35 ppt
Sediment: 1 ppt	Non-detected
Fish: 1 ppt	Non-detected
Water: low ppqd	100 ppqd

Tier 7 (Rural Soil)	
No. of sites	148
No. sampled	131
No. completely analyzed	1
% of completed > 1 ppt	0%

Tier 7 (Urban Soil)	
No. of cities sampled	19
No. of cities sampled	18
No. completely analyzed	74
% of analyzed > 1 ppt*(5)	7%

Tier 7 (Fish)	
No. of sites	399
No. sampled	386
No. completely sampled	250
% of completed > 1 ppt* (6)	22%

(5) Highest value 5 ppt

(6) Highest value in whole fish 29 ppt
Highest value in fillet 13 ppt

*The Centers for Disease Control have identified 1000 ppt as a level of concern for 2,3,7,8-TCDD in residential soil. The Food and Drug Administration has suggested limiting consumption of fish contain > 25 ppt of 2,3,7,8-TCDD.

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